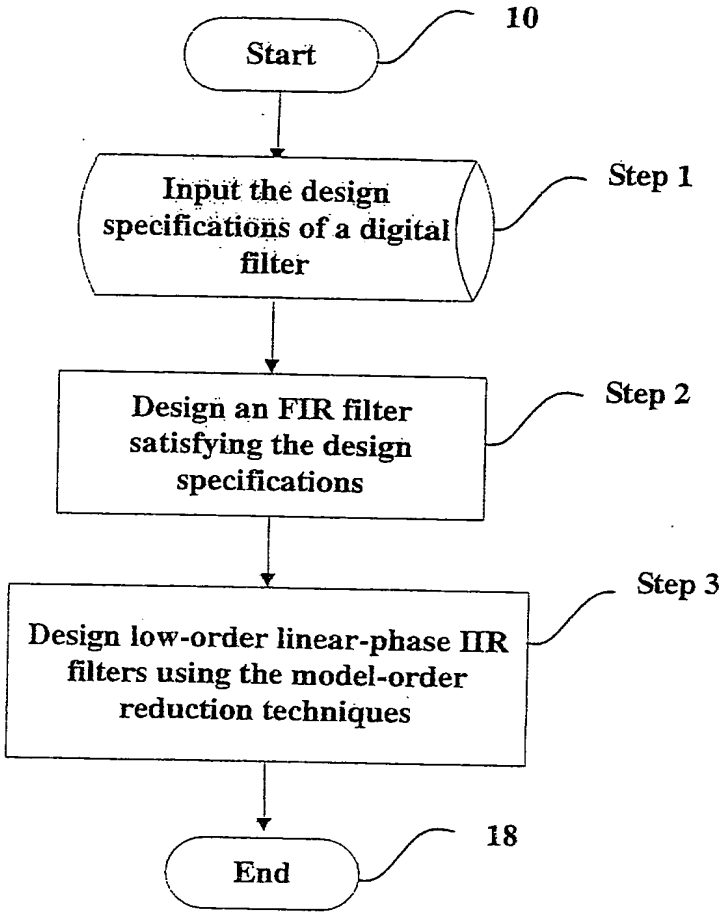

FIG.1

PRIOR ART

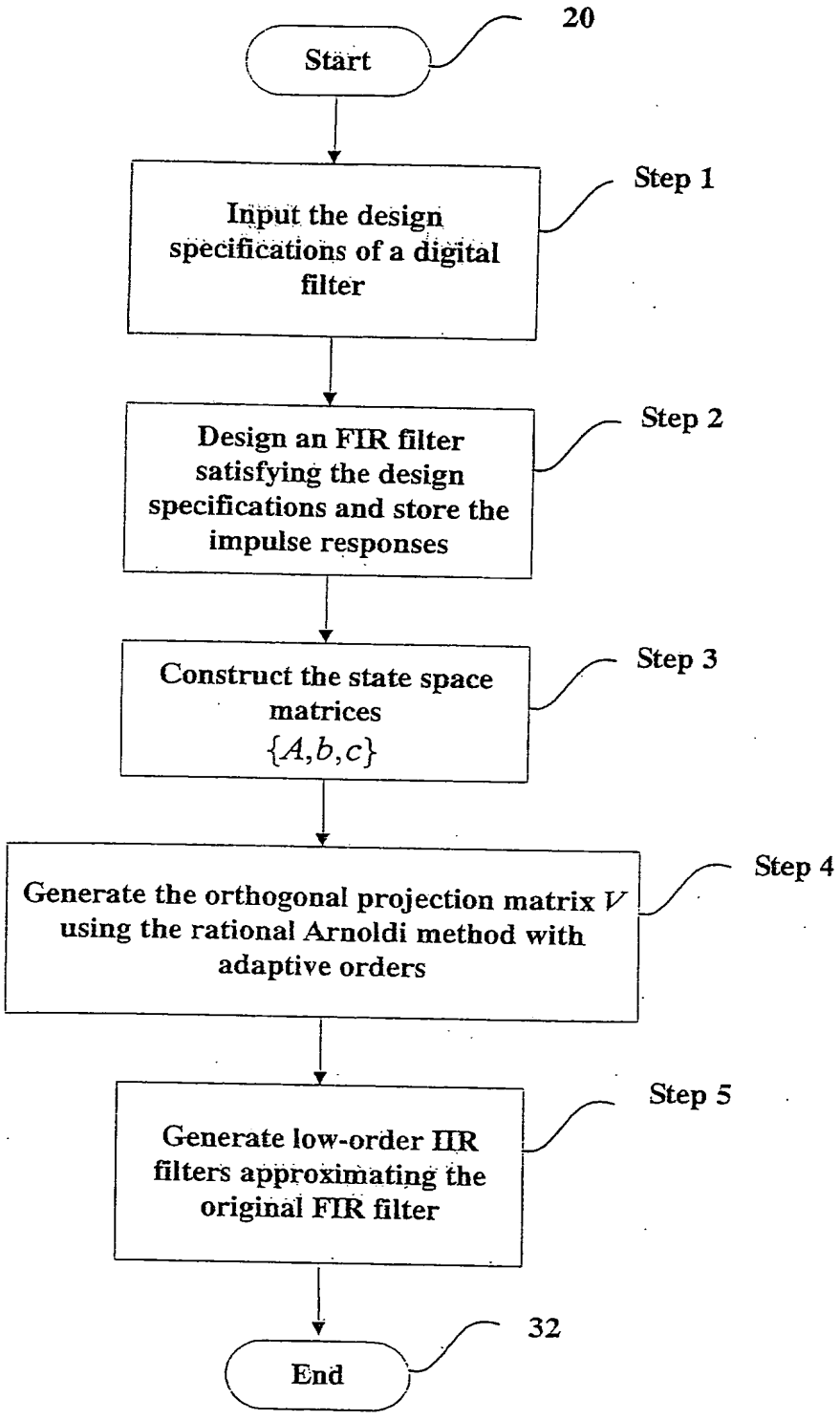
20
Start
Step 1
Input the design specifications of a digital filter
Step 2
Design an FIR filter satisfying the design specifications and store the impulse responses
Step 3
Construct the state space matrices $\{A,b,c\}$
Step 4
Generate the orthogonal projection matrix V using the rational Arnoldi method with adaptive orders
Step 5
Generate low-order IIR filters approximating the original FIR filter
32
End

FIG.2

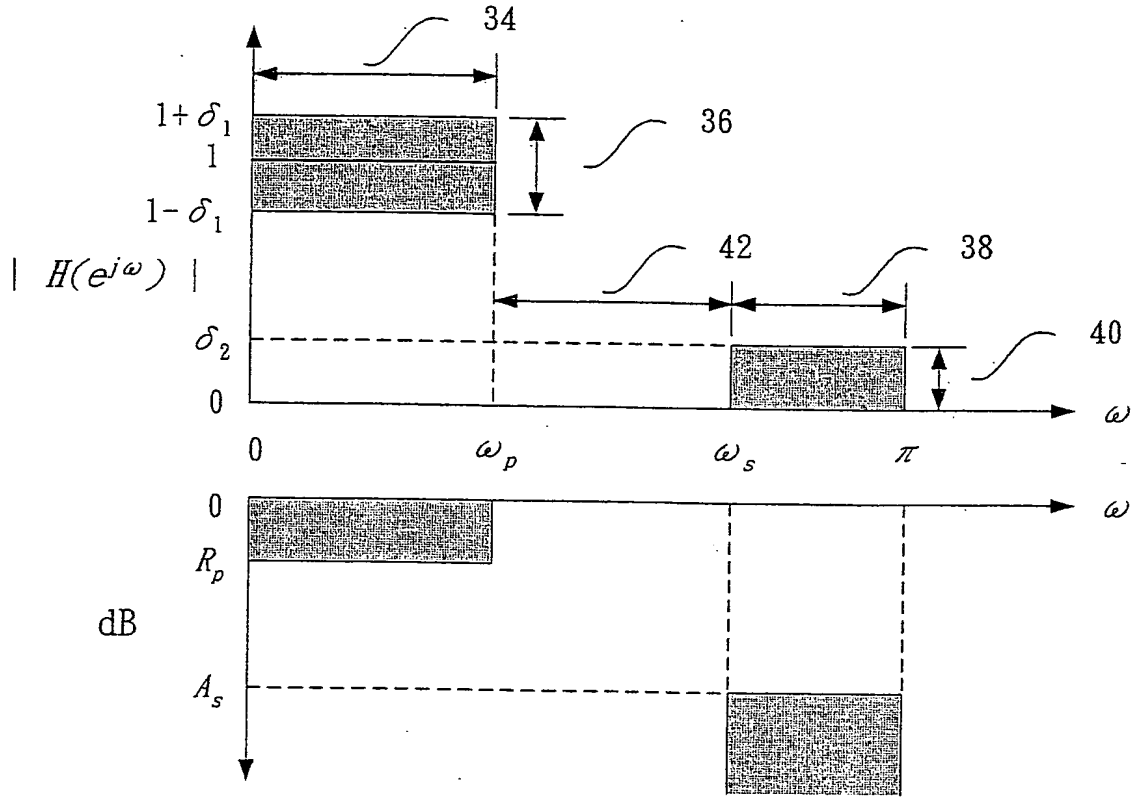
34
36
42
38
40
$1+\delta_1$
1
$1-\delta_1$
$|H(e^{j\omega})|$
δ_2
0
ω
0
ω_p
ω_s
π
0
ω
R_p
dB
A_s

FIG.3

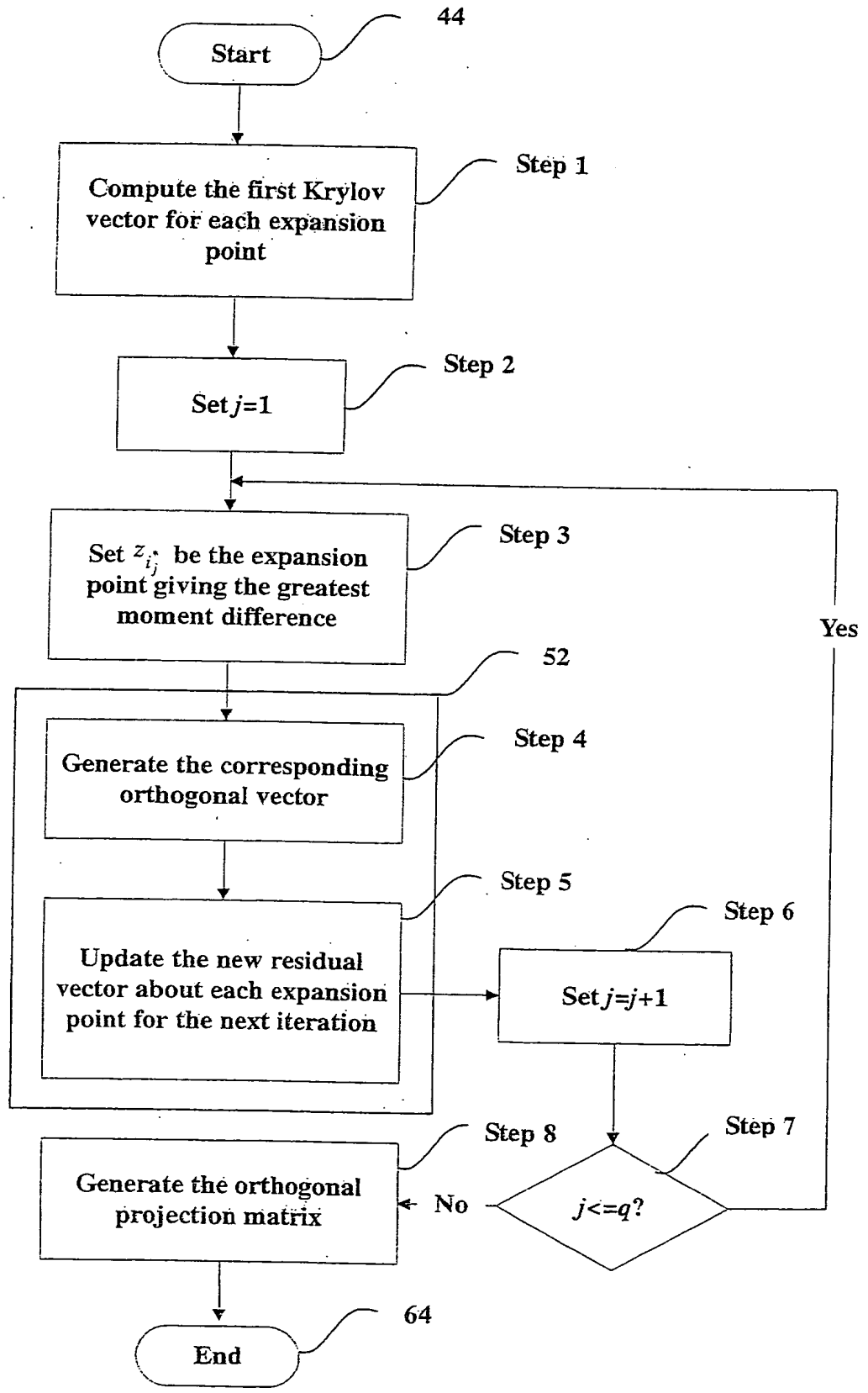
44
Start
Step 1
Compute the first Krylov vector for each expansion point
Step 2
Set j=1
Step 3
Set $z_{i_j^*}$ be the expansion point giving the greatest moment difference
Yes
52
Step 4
Generate the corresponding orthogonal vector
Step 5
Update the new residual vector about each expansion point for the next iteration
Step 6
Set j=j+1
Step 8
Step 7
Generate the orthogonal projection matrix
No
j<=q?
64
End

FIG.4

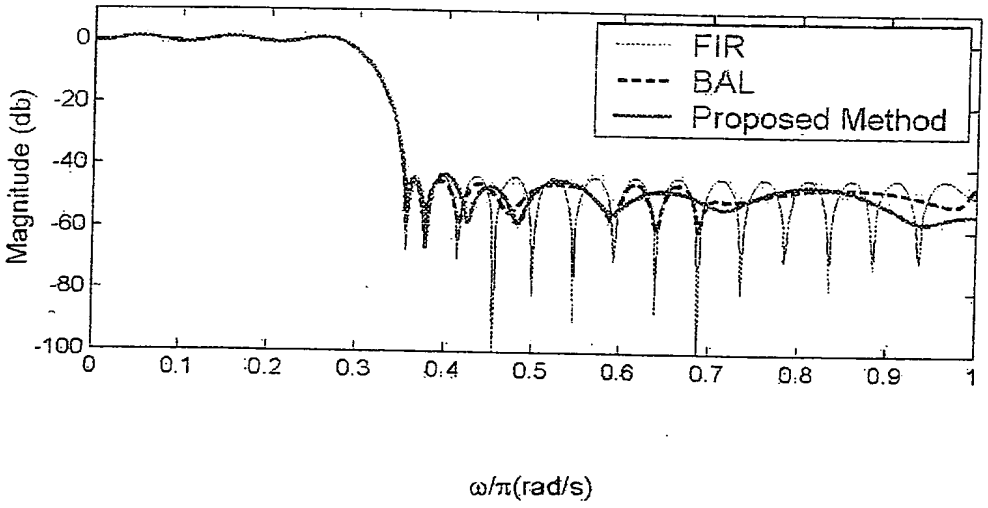
FIR
BAL
Proposed Method
Magnitude (db)
0
-20
-40
-60
-80
-100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
ω/π(rad/s)

FIG.5A

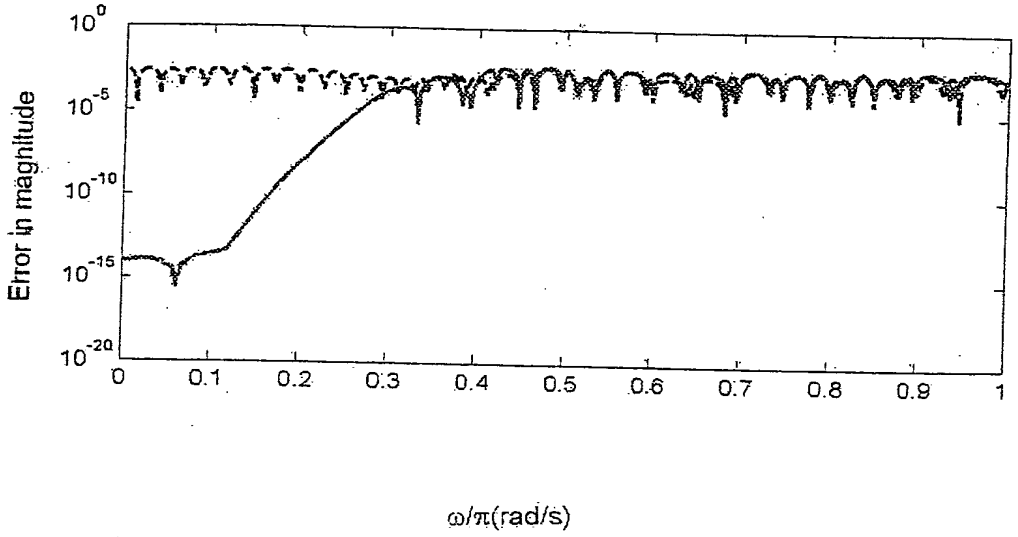
Error in magnitude
10^0
10^-5
10^-10
10^-15
10^-20
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
ω/π(rad/s)

FIG.5B

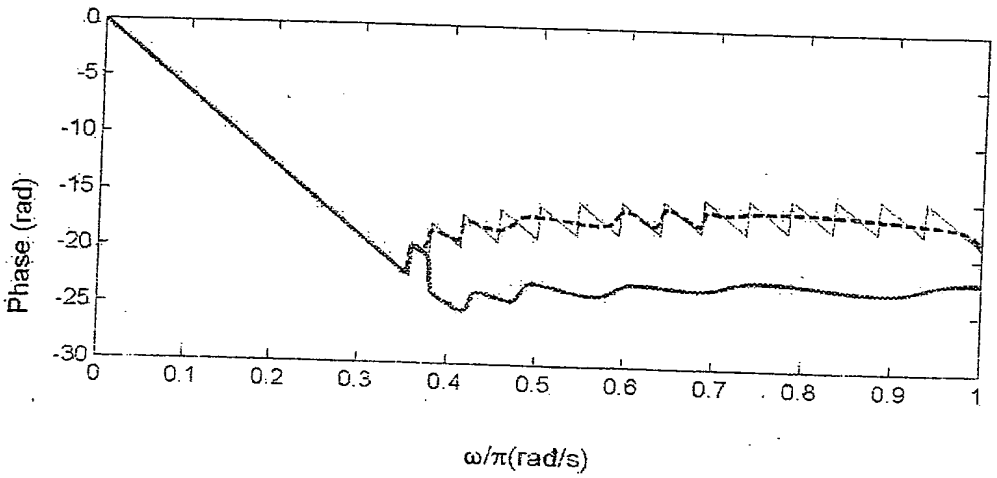

FIG.5C

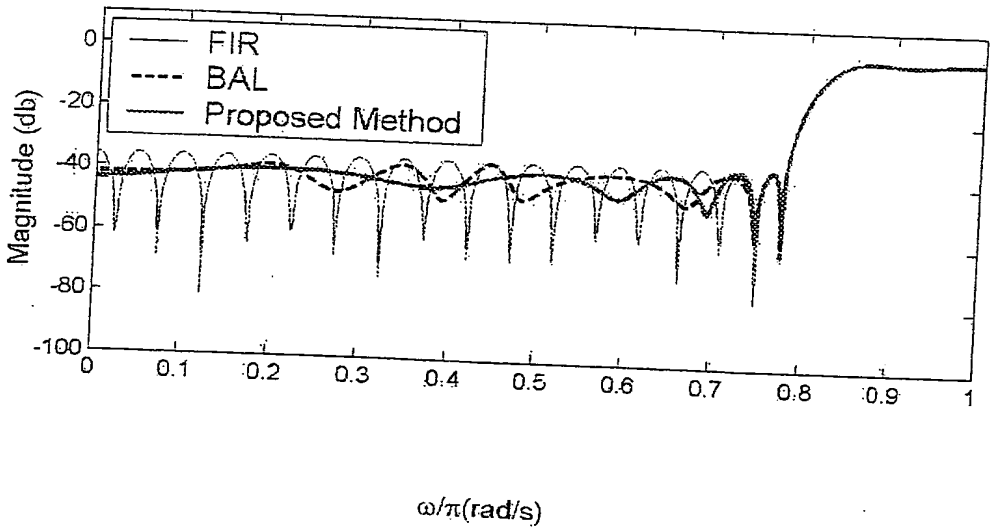
FIR
BAL
Proposed Method
Magnitude (db)
0
-20
-40
-60
-80
-100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
ω/π(rad/s)

FIG.6A

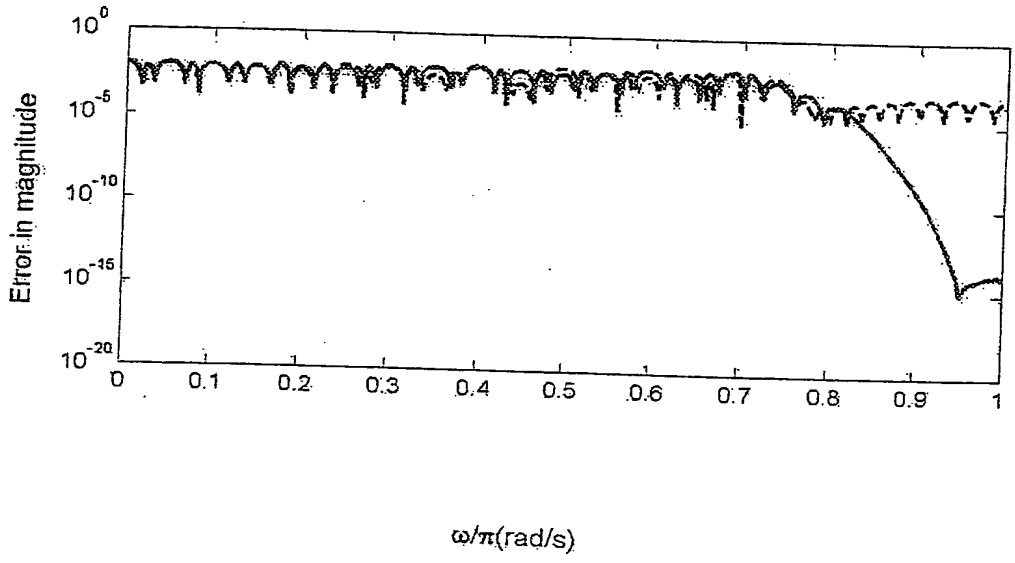
Error in magnitude
10^{0}
10^{-5}
10^{-10}
10^{-15}
10^{-20}
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
ω/π(rad/s)

FIG.6B

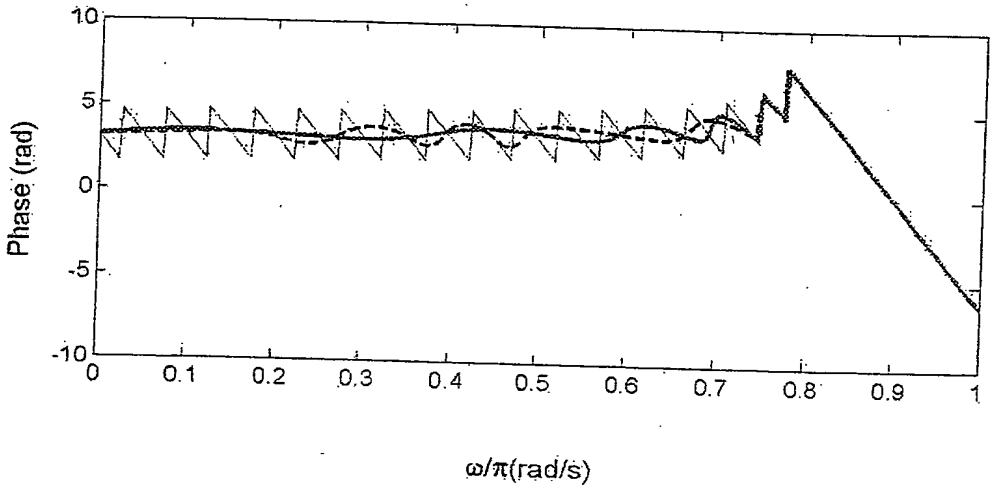

FIG.6C

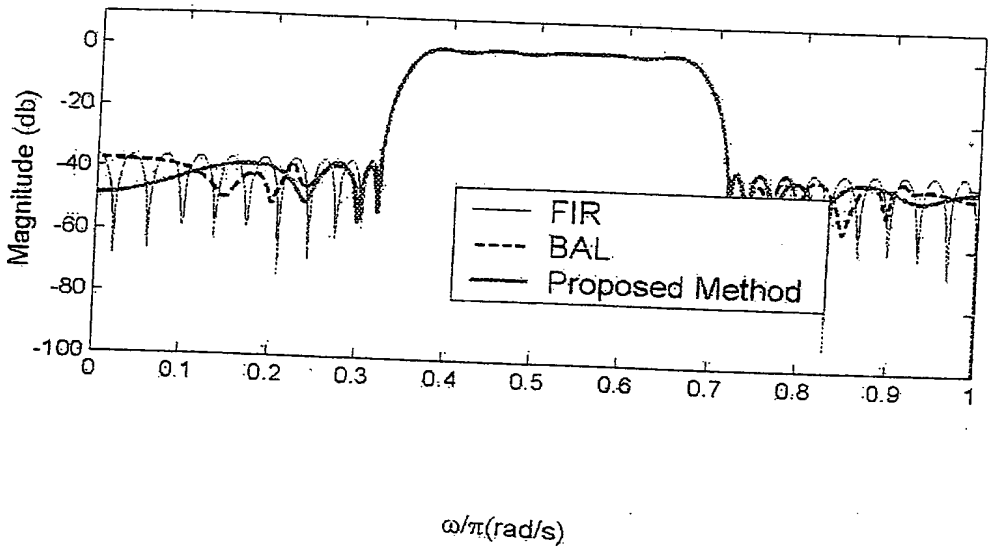
Magnitude (db)
0
-20
-40
-60
-80
-100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
FIR
BAL
Proposed Method
ω/π(rad/s)

FIG.7A

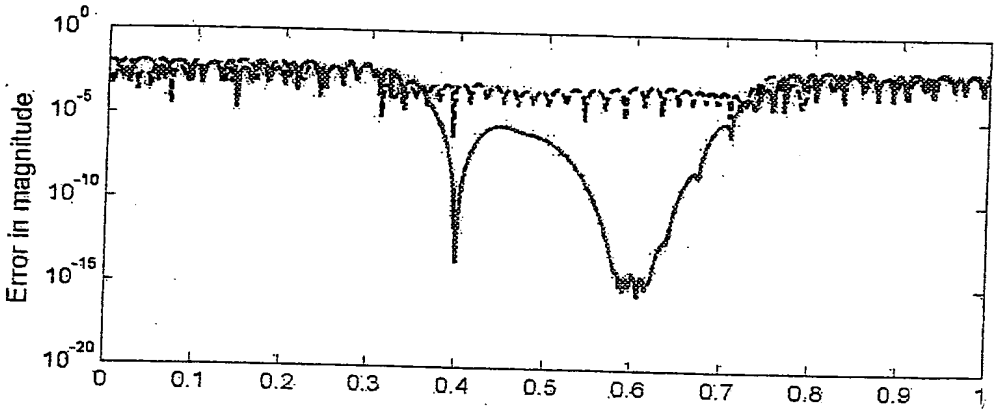
Error in magnitude
10^{0}
10^{-5}
10^{-10}
10^{-15}
10^{-20}
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
ω/π(rad/s)

FIG.7B

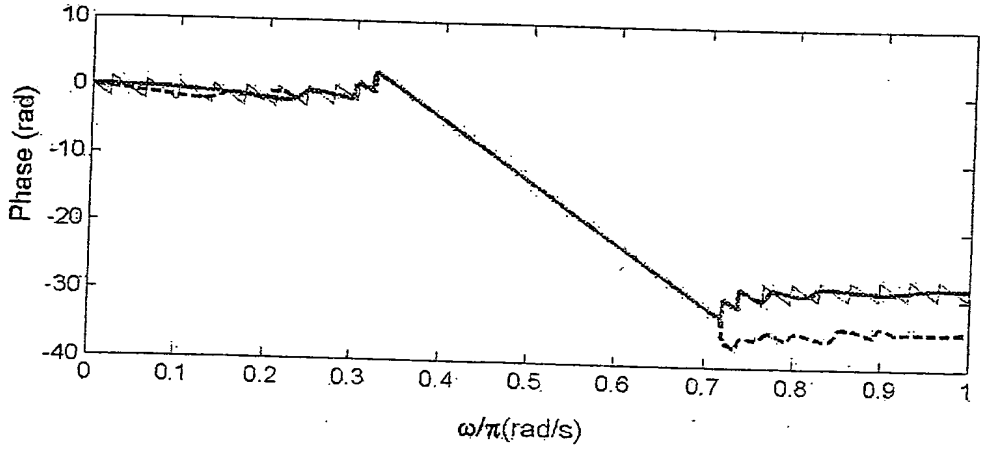

FIG.7C